Claims 1-8 are all the claims presently pending in the application. New claims 31-42 have been added to more particularly define the invention. Claims 5, 7, and 8 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Jin et al. (U.S. Patent No. 6,284,675). Claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Jin et al. Reconsideration is respectfully requested.

These rejections are respectfully traversed in view of the following discussion.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

It is noted that the amendments are made only to more completely define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability.

Attached hereto is a marked-up version of the changes made to the specification and/or claims by the current Amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and claimed, for example by independent claim 1, is directed to a semiconductor device, and very similar independent claim 5, is directed to a semiconductor wafer.

The semiconductor device, including a multi-layered insulation film formed on a semiconductor substrate, the multi-layered insulation film including a first insulation layer comprising an organic material having a dielectric constant which is lower than a silicon dioxide dielectric constant, a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of the first insulation layer, and a third insulation layer comprising an inorganic material and formed on and adhering to a top of the second insulation layer.(See Page 16, 3rd Paragraph, lines 14-21).

Conventional devices have a first layer composed of an organic material of low dielectric, i.e., an organic SOG film e.g., Methyl Silsesquioxane ("MSQ") coated with a layer composed of an inorganic protective film, e.g., silicon oxide film. However, the conventional art is not effective because peeling occurs at the interface of the inorganic protective film and the organic layer, and thus de-lamination due to insufficent adhesion produces cross-talk in the semiconductor device . (See Page 2, lines 12-27; and Page 6, line 23 - Page 2, line 4).

The claimed device, on the other hand, has a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of the first insulation layer. This layer provides excellent adhesion to the first insulation layer as well as the third insulation layer. (See Page 16, 3rd Paragraph, lines 14-21).

As a result of this inventive structure, the interfacial adhesion between the film with low dielectric constant, i.e., the first insulation layer, and protective film, i.e., the second insulation and adhesive layer, is significantly improved, "without damaging the excellent dielectric, flatness and gap-filling characteristics of the organic material of the low dielectric constant." (See Page 6, 3rd Paragraph, lines 15-20).

II. THE PRIOR ART REJECTIONS

A. The 35 USC § 102(e) Rejection Based on Jin, et al.

The Examiner alleges that Jin, et al. ("Jin") teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Jin.

Jin recites a method of forming an integrated circuit dielectric by evaporating solvent to yield phase separation. In particular, a phase separation occurs during solvent evaporation of a solution containing polymer precursors leaves a low pressure solvent without polymer precursor in minimal gaps. After polymerization, the low pressure solvent is driven off to yield air gaps in the minimal gaps under the polymer. (See Jin at Abstract).

However, Jin does not teach or suggest "a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of the first insulation layer"as recited in claim 5.

Further, the claimed invention includes a first insulating layer comprising an organic material, e.g., organopolysiloxane as recited in dependent claim 2, having a lower dielectric constant than silicon oxide. In Jin, however, as indicated in the Office Action and cited above, the first insulation layer does not include an organic material. Therefore, Jin has at least one significant structural differences when compared to the structure of Applicant's invention.

For at least the reasons outlined above, Applicant respectfully submits that Jin does not disclose, teach or suggest all the features of independent claim 5. Accordingly, Jin does not anticipate or render obvious the subject matter of claim 5. Withdrawal of the rejection of claims 5, 7 and 8 under 35 U.S.C. § 102(e) as anticipated by Jin is respectfully requested.

Finally, for the above cited reasons, regarding the dependent claims 7 and 8, which depend from claim 5, these claims are patentable not only by virtue of their dependency from the independent claim 5 but also by the additional limitations they recite.

For the reasons stated above, the claimed invention is fully patentable over the cited reference.

B. The § 103(a) Rejection

The Examiner alleges that claims 1-4 are rejected over Applicant's admitted prior art in view of Jin, which teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the admitted prior art nor Jin.

First, the references, separately, or in combination, fail to teach, disclose or provide a reason or motivation for being combined. In particular, the admitted prior art pertains to a process of forming a damascene copper wiring system of a low dielectric constant material for use in decreasing inter-wire capacity in order to cope with the higher-speed operation of semiconductor devices. (See Application, Background Section, Page 1, 2nd and 3rd Paragraphs, lines 8-15).

However, Jin does not have the same aim as the admitted prior art. Jin pertains to a method of forming integrated circuit dielectrics by evaporating solvent to yield phase separation. Thus, Jin's invention is intended to increase the performance of high density integrated circuits by reducing the metal interconnect level RC time delays due, in part, to the capacitive coupling between adjacent lines and, in particular, reducing the capacitive cooling through a decrease in the relative permeability (dielectric constant, k) of the dielectric (insulator) between adjacent lines. (See Column 1, lines 15-33).

Accordingly, Jin's invention attempts to solve a significant problem of reducing metal interconnect level RC time delays and capacitive cooling by producing an integrated circuit through solvent evaporation techniques. Thus, Jin clearly does not pertain to decreasing the inter-wire capacity in order to cope with the higher-speed operation of semiconductor devices as discussed above. (See Application, Background Section, Page 1, 2nd and 3rd Paragraphs, lines 8-15). Therefore, these references would not have been combined as alleged by the Examiner.

Even assuming arguendo that Jin and the admitted prior art were trying to solve the same problem, which they are not, Jin's technique of solvent evaporation is significantly different and has nothing to do with the admitted prior art discussed above, which does not involve solvent evaporation.

Therefore, one of ordinary skill in the art would not have combined these references, in any combination. Further, the Examiner provides no motivation or reason to combine other than to assert that it would be obvious to one having ordinary skill in the art at the time to incorporate different layers from the other reference. However, such an assertion does not take into account the distinct methods and resultant structural differences and deficiencies of the two references as indicated above, and thus attempts to solve a problem which does not exist with the admitted prior art.

Second, the admitted prior art, like Jin, does not teach or suggest ""a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of the first insulation layer"as recited in claims 1 and 5. Indeed, the admitted prior art merely depicts a first layer composed of an organic material of low dielectric, i.e., an organic SOG film e.g., Methyl Silsesquioxane ("MSQ") coated with a

second layer composed of an inorganic protective film, e.g., silicon oxide film. (See Page 2, lines 12-27; and Page 6, lines 23 - Page 2, line 4).

The admitted prior art does not make up for the deficiencies of Jin.. Therefore, even if the admitted prior art would have been combined with Jin, the combination would not teach or suggest each and every element of the claimed invention.

Finally, regarding the dependent claims, 2-4 and 6-8, which depend from claims 1 and 5, these claims are patentable not only by virtue of their dependency from their respective independent claims but also by the additional limitations they recite.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

III. FORMAL MATTERS AND CONCLUSION

The title has been amended to be more indicative of the invention to which the claims pertain and to overcome the Examiner's objection to the abstract.

In response to the Examiner's objection, and upon further review, to the drawings, submitted herewith are proposed drawing corrections to Figures 5-7 to label them as "Prior Art."

In view of the foregoing, Applicant submits that claims 1-8 and 31-42, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed

below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 8/22/02

Fredric J. Zimmerman, Esq.
Reg. No. 48,747

McGinn & Gibb, PLLC
8321 Old Courthouse Rd., Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 21254

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Title:

The title has been amended:

SEMICONDUCTOR DEVICE AND SEMICONDUCTOR WAFER[, AND METHODS OF PRODUCING THE SAME DEVICE AND WAFER] (Amended)

In the claims:

Please cancel claims 9-30 without prejudice or disclaimer.

The following claims have been amended:

1. (Amended) A semiconductor device comprising: [, in which]

a multi-layered insulation film [is] formed on a semiconductor substrate [and wires are formed in said multi-layered insulation film], [characterized in that] said multi-layered insulation film comprising: [comprises]

a first insulation layer comprising [composed of] an organic material having a [low] dielectric constant which is [has a] lower [dielectric constant] than a silicon oxide dielectric constant[,];

a second insulation layer comprising [composed of] a polysiloxane compound having an Si-H group and formed on and adhering to [being in contact with] a top of said first insulation layer[,]; and

a third insulation layer comprising [composed of] an inorganic material and formed on and adhering to [being in contact with] a top of said second insulation layer.

2. (Amended) The semiconductor device according to claim 1, wherein [characterized in that]

said first insulation layer comprises at least one [is composed] of an organopolysiloxane [or] and an aromatic-containing organic resin.

3. (Amended) The semiconductor device according to claim 1, wherein [characterized in that] said second insulation layer comprises at least one [is composed] of hydrogen silisesquioxane and [and/or] a hydride organosiloxane.

4. (Amended) The semiconductor device according to claim 1, wherein [characterized in that] said third insulation layer comprises at least [is composed of] one [or more] material [materials] selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride.

5. (Amended) A semiconductor wafer comprising: [with]

a multi-layered insulation film formed on a [one] surface of the wafer, [characterized in that] said multi-layered insulation film [comprises] comprising:

a first insulation layer comprising [composed of] an organic material having a [of low] dielectric constant which is [has a] lower [dielectric constant] than a silicon oxide dielectric constant[,];

a second insulation layer comprising [composed of] a polysiloxane compound having an Si-H group and formed on and adhering to [being in contact with] a top of said first insulation layer[,]; and

a third insulation layer comprising [composed of] an inorganic material and formed on and adhering to [being in contact with] a top of said second insulation layer.

6. (Amended) The semiconductor wafer according to claim 5, wherein [characterized in that] said first insulation layer comprises at least one [is composed] of an organopolysiloxane [or] and an aromatic-containing organic resin.

7. (Amended) The semiconductor wafer according to claim 5, wherein [characterized in that] said second insulation layer comprises at least one [is composed] of hydrogen silisesquioxane and a [and/or] hydride organosiloxane.

8. (Amended) The semiconductor wafer according to claim 5, wherein [characterized in that] said third insulation layer is comprises at least [composed of] one [or more] material [materials] selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride.